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EXPERIMENTAL INVESTIGATION ON CONCRETE WITH GRANITE SLUDGE POWDER AS A PARTIAL REPLACING MATERIAL

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ABSTRACT - *River sand is nowadays a scarce commodity and exploring alternatives. So an attempt is made on replacing the granite sludge powder as a partial replacement for fine aggregate in concrete. The study is carried out with 20, 40, 60 and 80 percentage replacement of fine aggregate by the granite sludge powder in M20 grade concrete. The workability of fresh concrete, compressive strength and split tensile strength of hardened concrete mix at 7th,14th and 28th days of curing period is determined and results are analysed and compared with the conventional mix.*

Keywords- Granite sludge powder (GSP)

I. INTRODUCTION

Due to the recent spurt in construction activity brought out by the current economic boom, the cost of construction has been increasing up by 15% every year. A major factor for this escalation in cost is the price of raw materials like cement, steel, timber, aggregates, etc. As conventional natural resources are being depleted, the costs of these materials are increasing. Current scientific data tells us that the plasticity and hardened state properties are affected greatly by the type of aggregate used. Aggregate make up a bulk (up to 80%) of the concrete mix, their properties are crucial to the properties of the concrete. Different types of aggregates that are commonly used are natural sands and gravels, crushed rocks and manufactured aggregates. Concrete is a heterogeneous mixture of cement, fine and coarse aggregates. So the attempt is made to find out an eco-friendly substitute for the fine aggregate by using granite sludge powder. In this research work, the fine aggregate is replaced by the granite sludge powder by 20%, 40%, 60% and 80% in M_{20} grade concrete. Then their strength parameters are determined at 7^{th}, 14^{th}, 28^{th} days of curing and it is compared with the conventional concrete mix.

II. MATERIALS USED

A. *Cement*

The ordinary Portland cement of grade 53 is used in this research work, which binds the various ingredients of the concrete together in the addition of water.

B. *Fine Aggregate*

The river sand which passes through IS4.75mm sieve is used as the fine aggregate in this research work.

C. *Coarse Aggregate*

The crushed stone of 20mm size with adequate strength and toughness is used as a coarse aggregate in this research work.

D. *Granite Sludge powder*

Granite industries produce lot of dust and waste materials. The waste generated from the granite polishing units is being disposed and dumped as filling materials which cause health hazard to environment. This granite powder waste has been utilized as fine aggregate with partial replacement of sand. The proportions of granite powder added by weight to replace sand by weight were in terms of 20%, 40%, 60% and 80%.

Fig.1 *- GSP*

III. MATERIAL PROPERTIES

A. *Property of cement*

The cement used in this research work exhibits the following property,

Table I – Property of cement

Property	Cement
Initial setting time	35mins
Final setting time	9.5 Hours
Specific Gravity	3.06

B. Property of river sand and GSP

The normal river sand and granite sludge powder used in this research work exhibits the following property,

Table II *– Property of river sand and GSP*

Property	River Sand	GSP
Fineness modulus	3.98%	2.88%
Specific Gravity	2.56	2.7
Bulk density	1695kg/m^3	1745kg/m^3

C. *Property of Coarse aggregate*

The coarse aggregate used in this research work exhibits the following property,

Table III *– Property of coarse aggregate*

Property	Coarse aggregate
Bulk Density	1463kg/m^3
Fineness modulus	6.5%

IV. TEST ON FRESH CONCRETE

The workability of the different mixes having 0%, 20%, 40%, 60% and 80% of GSP is observed using the slump cone test and they are tabulated below,

Table IV *– Slump Cone test on fresh concrete*

Combination	Slump value (mm)	Remarks
CC	60	Good
20% GSP	50	Good
40% GSP	40	Stiff
60% GSP	68	Good
80% GSP	60	Good

V. TESTING OF SPECIMENS

Totally 30 cubes and 30 cylinders were prepared for the 7th, 14th & 28th day testing with 0%, 20%, 40%, 60%and 80% of sand by GSP.

Table V *– Specimens*

Replacement Percentage	No of Cubes	No of Cylinders
CC	3	3
20% GSP	3	3
40% GSP	3	3
60% GSP	3	3
80% GSP	3	3

A. *Compression test on cubes*

The compression test is done on 7th, 14th, 28th day of curing to determine the compressive strength of concrete specimens.

Table VI *– Compressive strength of cubeS*

Percentage of replacement	Compressive strength N/mm^2		
	At 7th day	At 14th day	At 28th day
CC	21.82	27.03	33.4
20% GSP	18.81	24.52	32.74
40% GSP	17.7	21.85	28.08
60% GSP	13.19	28.08	27.03
80% GSP	15.71	27.33	24.52

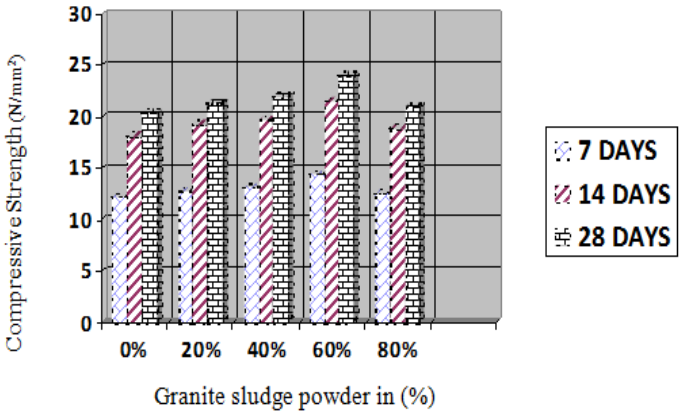

Fig.2 *- Compressive Strength of cubeS*

B. *Split tensile test on cylinders*

The test is done on 7th, 14th, 28th day of curing to determine their split tensile strength and the results are tabulated below,

Table VII *– Split tensile strength of cylinders*

Percentage of replacement	Tensile strength N/mm^2		
	7th day	14th day	28th day
CC	21.82	27.03	33.4
20% GSP	18.81	24.52	32.74
40% GSP	17.7	21.85	28.08
60% GSP	13.19	28.08	27.03
80% GSP	15.71	27.33	24.52

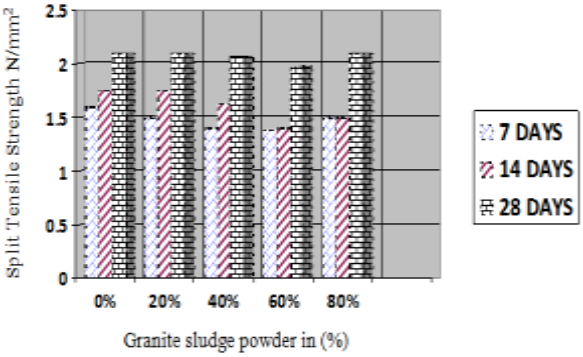

Fig.3 *– Tensile strength of cylinderS*

VI. RESULTS AND DISCUSSIONS

Specimens were prepared by cubes and cylinders. Compressive Strength was tested by cubes at the age of 7th, 14th and 28th days and Split Tensile Strength was tested by cylinders at the age of 7th, 14th and 28th days. From the test results, the following conclusions has been made,

- The compressive and split tensile strength of the concrete specimens increases when the percentage of replacement of fine aggregate by granite sludge powder increases.
- 17% increment in the compressive strength is observed when the 60% of Fine Aggregate is replaced by the Granite Sludge Powder.
- The optimum percentage at which the granite powder is replaced by the fine aggregate is found to be 60% beyond which the strength decreases.

REFERENCES

[1] Baboo Rai , Khan Naushad H , Abhishek Kr , Tabin Rushad S and Duggal S.K, "Influence of Marble powder/granules in Concrete mix", International Journal of Civil and Structural Engineering, Vol 1, No 4, 2011, PP 827-834.

[2] Bahar Demirel, "The effect of the using waste marble dust as fine sand on the mechanical properties of the concrete", International Journal of the Physical Sciences, Vol. 5, no. 9, 18 August, 2010, PP 1372-1380.

[3] Bouziani Tayeb, Benmounah Abdelbaki, Bederina Madani and Lamara Mohamed, "Effect of Marble Powder on the Properties of Self-Compacting Sand Concrete", The Open Construction and Building Technology Journal, 2011, vol. 5, PP 25-29.

[4] Felixkala T and Partheeban P, "Granite Powder Concrete", Indian Journal of Science and Technology, Vol 3, no. 3, mar 2010, PP 311-317.

[5] Hanifi Binici, Hasan Kaplan and Salih Yilmaz, "Influence of marble and limestone dusts as additives on some mechanical properties of concrete", Academic Journals, vol 2, no. 9, sep 2007, PP 372-379.

[6] Kanmalai Williams C., Partheeban P and Felix Kala T, "Mechanical Properties of High Performance Concrete Incorporating Granite Powder as Fine Aggregate", India International Journal on Design and Manufacturing Technologies, Vol.2, No.1, July 2008, PP 67-73.

[7] Oyekan G.L and Kamiyo O.M, "Effects of granite fines on the structural and hygrothermal properties of sandcrete blocks", Nigeria journal of Engineering and Applied sciences, vol 3, no.3, 2008,PP 735-741.

[8] Shahul Hameed M, Sekar A.S.S and Saraswathi V, "Chloride Penetration Study on Self-Compacting Green Concrete Using Crusher Rock Dust and Marble Sludge Powder as Fine Aggregate",KSCE journal of civil engineering,vol.16,no.6,2012,PP 980-988.

[9] Shahul Hameed M and Sekar A.S.S, "Properties of Green Concrete Containing Quarry Rock Dust and Marble Sludge Powder as Fine Aggregate", ARPN Journal of Engineering and Applied Sciences, vol. 4, no. 4, june 2009, PP 83-89.

